

Meeting Energy Needs and Managing Nuclear Materials

As a national resource, Livermore is part of the government–industry partnership to meet long-term needs for dependable, affordable, clean energy. The Laboratory has a long history of contributing, particularly in research areas—such as fusion energy and management of nuclear materials—that align with Livermore’s national security mission or draw on special expertise. Energy research projects benefit from Livermore’s multidisciplinary approach to problem solving and integrated capabilities that extend from basic science to prototype demonstration.

Technical Support for the Yucca Mountain Project

In January 2002, Secretary of Energy Spencer Abraham notified the governor of Nevada of his intention to recommend to the President approval of the Yucca Mountain site for the development of a repository to store up to 77,000 tons of high-level radioactive waste. Subsequently, President Bush gave his authorization, and State of Nevada officials expressed their disapproval and intention to take actions to stop the project.

A solid technical foundation is vital for the Yucca Mountain Project and political decisions concerning its future. The Laboratory has been helping DOE to address some of the most significant scientific challenges. Livermore led the preparation of three of the nine Process Model Reports—for the waste package,

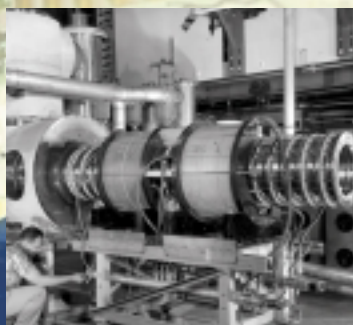
engineered barrier system, and near-field environment. These reports provided support for the Secretary’s site recommendation to the President.

In his recommendation, Secretary Abraham concluded that the Yucca Mountain site is scientifically sound and suitable. Before Presidential approval, the Nuclear Waste Technical Review Board, created by Congress to provide technical oversight of the project, reported that they found no single issue that would eliminate Yucca Mountain from consideration. The board did note that scientific uncertainties limited their confidence in long-term projections about performance.

Scientists are conducting materials performance tests to confirm that the waste

packages will maintain their integrity over thousands of years. This information is centrally important to decisions about licensing the site and how it is to be operated. The Laboratory has been testing the materials for making waste packages and researching the site’s geology to accurately predict the effect of the buried wastes on nearby geology. In addition, using Livermore’s supercomputers and new codes to simulate the geologic evolution of the repository, scientists are conducting pioneering analyses of how heat affects the mountain. The simulations are being used to predict the temperature evolution surrounding the buried waste and the possible means by which water might enter the repository tunnels over geologic time periods.

1950s



Fusion as an inexhaustible source of civilian power has long been a vision of Livermore scientists. Project Sherwood began as a classified fusion research program when the Laboratory opened. Computer modeling, plasma physics experiments, and studies of materials for reactor walls are the focus of current magnetic-fusion research efforts.

1960s



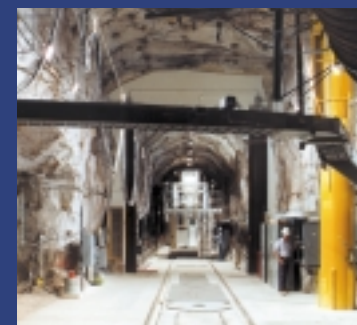
In 1967, the first of three joint government–industry field experiments, GASBUGGY, was conducted to investigate the feasibility of stimulating the production of natural gas in low-yield fields with nuclear explosives. GASBUGGY marked the beginning of continuing Laboratory efforts with industry to improve oil and gas recovery.

1970s



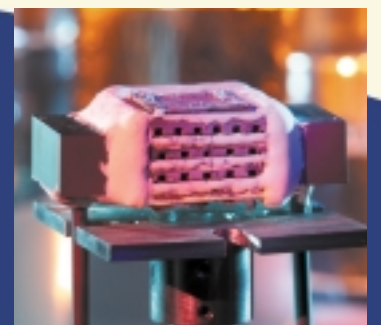
The energy crisis dramatically raised the priority of enhancing the nation’s energy security. Laboratory researchers engaged in a variety of energy projects that led to large-scale demonstrations of in situ coal gasification and oil extraction from shale. Other projects focused on battery research, geothermal energy, and energy conservation.

1980s



In the early 1980s, the Laboratory conducted the Spent Fuel–Climax experiment at the Nevada Test Site to study the feasibility, safety, and reliability of short-term storage of spent reactor fuel assemblies in granite rock. Livermore was also tasked by DOE to develop the waste package for what became the Yucca Mountain Project.

1990s



Advances by Laboratory researchers furthered the exploration of alternatives to carbon-based fuels and their more efficient use. Significant progress was made on fuel cells, electromechanical batteries, and use of hydrogen as fuel. Continuing reliance on nuclear power raised the need for improved tracking of nuclear materials in the U.S. and abroad.